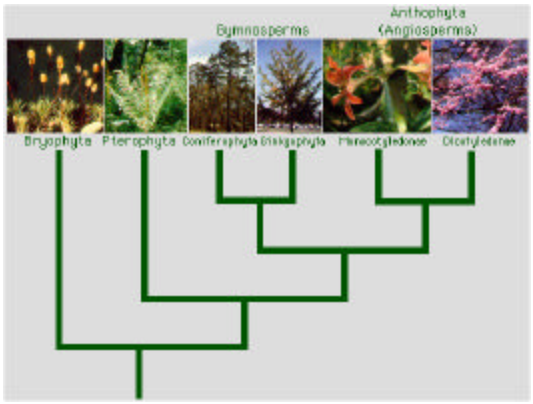


Science Assessment Activity # 7:

Carmaliticus

Science Assessed:
- Knowledge of classification systems and evolutionary change
- Ability to organize organisms into a phylogenetic tree according to observable characteristics

Introduction: To describe evolutionary change and classification systems, scientists use phylogenetic trees. Pictured above is an example of the organization of a phylogenetic tree into branches.

In this activity, you will take on the role of a scientist developing a phylogenetic tree to represent the evolutionary changes and classification of an imaginary organism called a Carmaliticus.

Attached are the 66 ***imaginary*** organisms, called Carmaliticus. They are organized according to Eras, indicated in the table below. The organisms and the Eras are ***not*** related to earth's geologic time periods or the conditions within earth's time periods.

Eras	Organism #	Time In Millions of Years Ago
Era A	66	245 – 209
Era B	64-65	208 – 145
Era C	60-63	144 – 67
Era D	53-59	66 – 58
Era E	43-52	57-37
Era F	29-42	36-24
Era G	15-28	23 – 6
Era H	8-14	5 – 2
Era I	4-7	1 - .1
Recent – Still Living	1-3	Present

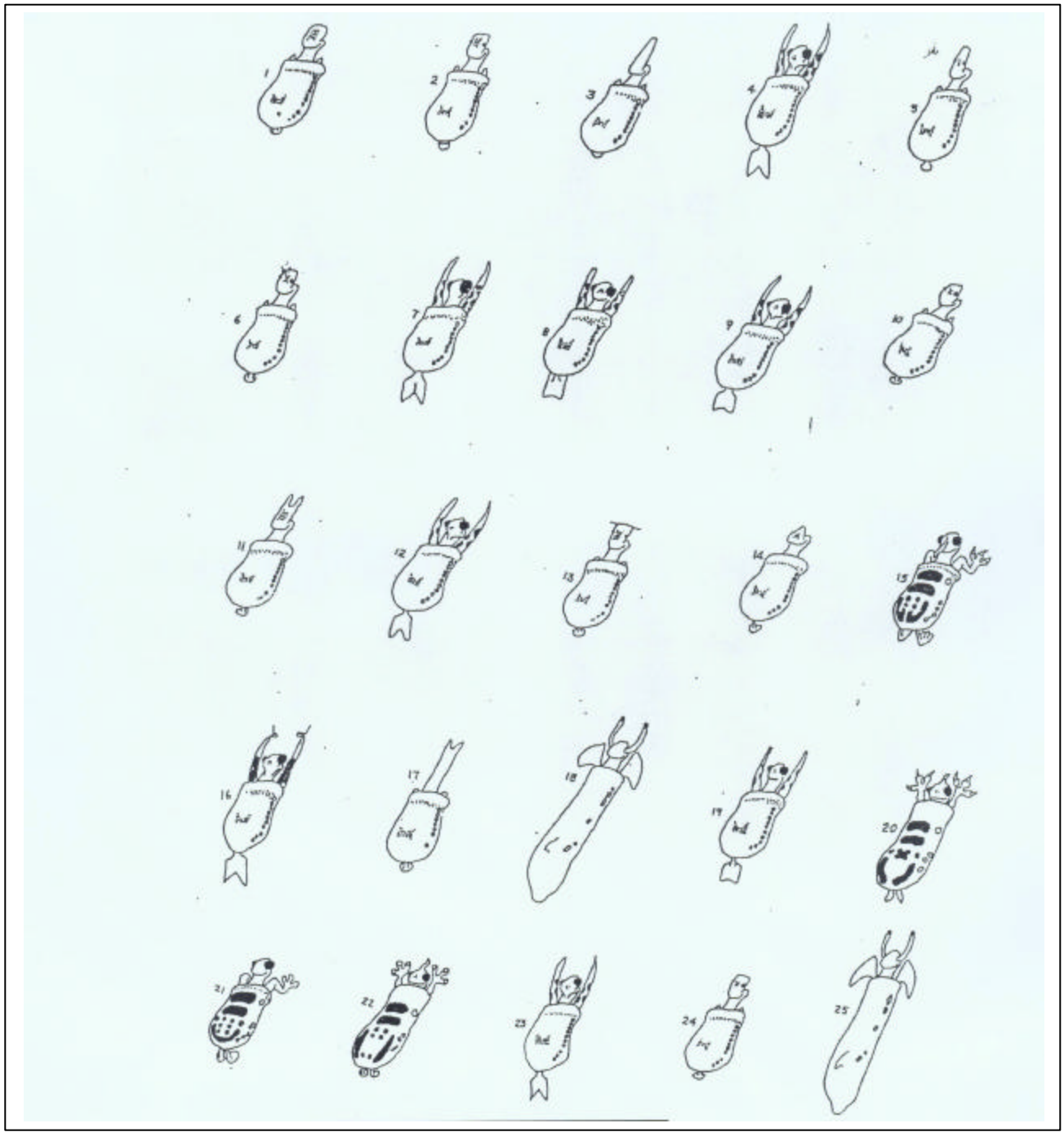
Part I – Phylogenetic Tree: Organize the Carmalitici into a phylogenetic tree according to Eras and characteristics of the Carmaliticus. On the tree, link each organism to only one organism from the previous Era, with a line; and indicate the extinction of a branch, with a labeled line.

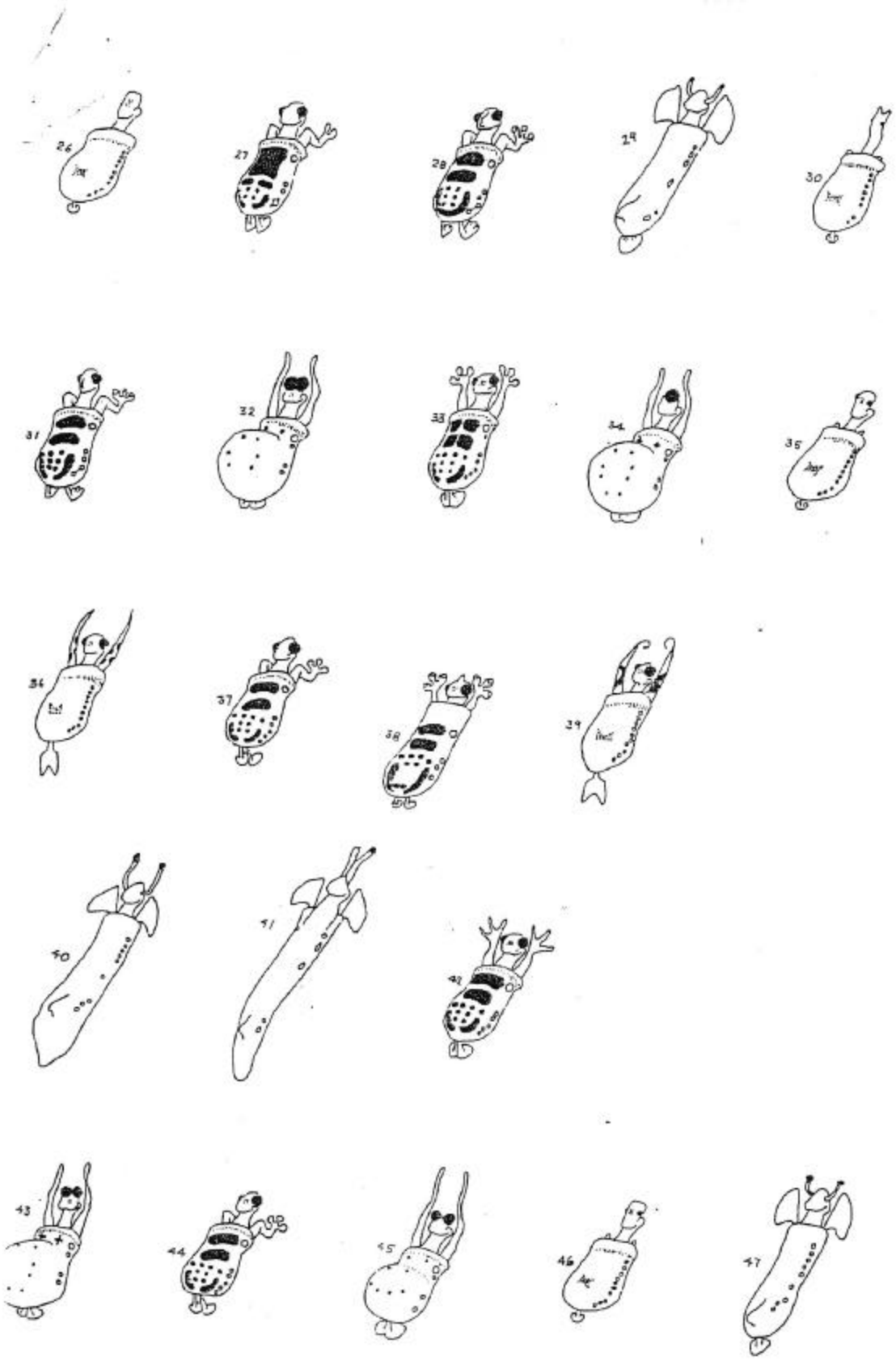
Part II –Written Explanation: Provide a written report with your phylogenetic tree that includes the following:

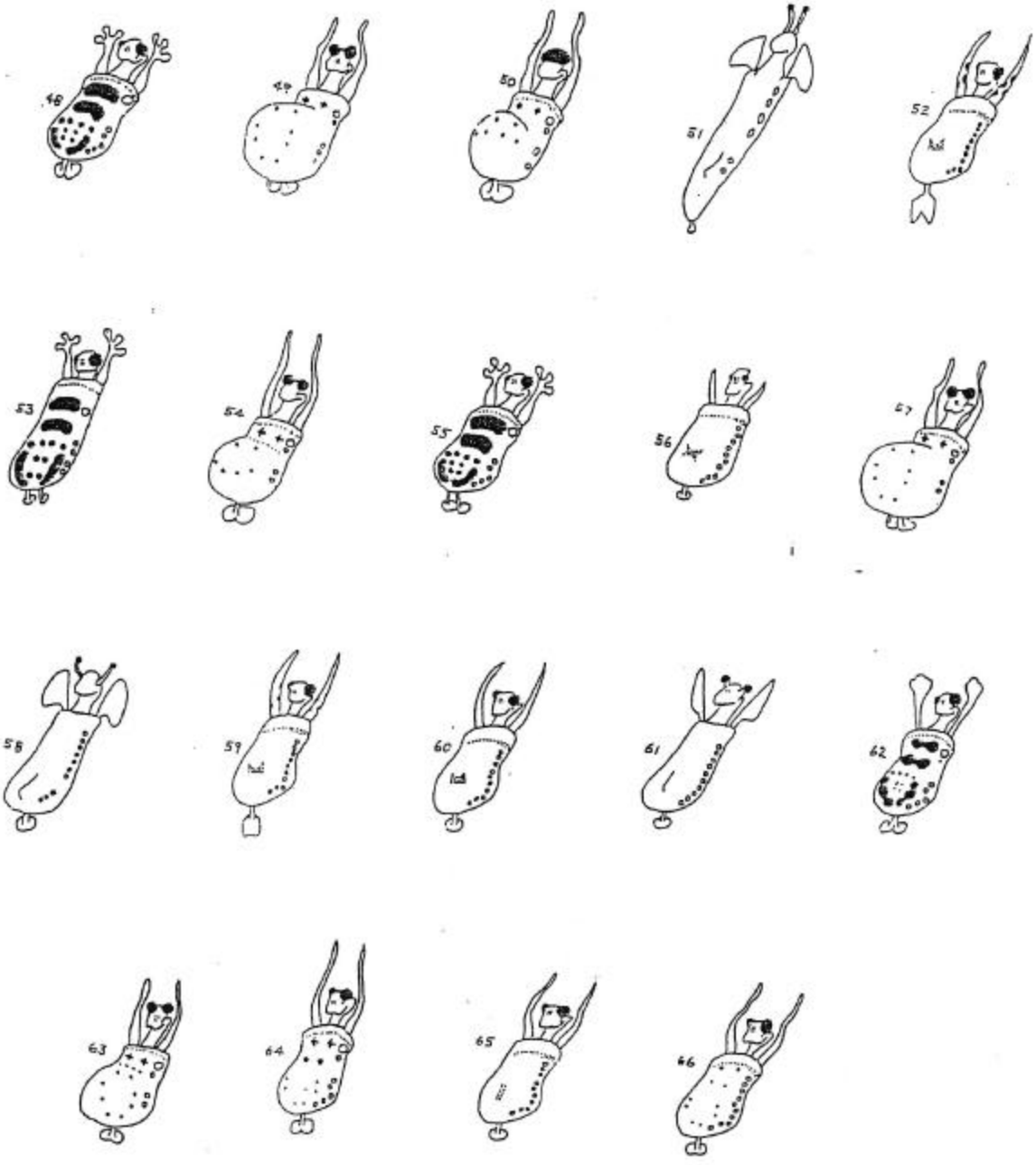
1) The reasoning you used to make decisions regarding placement of the Carmaliticus and their branches;
2) For *two* branches with *seven or more* Carmaliticus, describe how one organism evolved to another - based on identifiable characteristics of the organisms.
3) Possible environments of *four* Eras, supported with characteristics of the organisms that would justify your decisions;
4) A comparison of your phylogenetic tree to one other tree produced by a classmate. In your comparison, you are to identify at least two significant differences between your tree and the other tree, including a description about the difference in the organization and characteristics of all of the organisms within at least one branch and a comparison of the branches.

NOTE - Important considerations as you develop your phylogenetic tree:

a) Consider the organization of the entire tree before attaching the Carmaliticus.
b) Neatness and spacing will make a difference when you have to examine and explain the individual characteristics and the overall trends of the tree.
c) Based upon assumptions you make in the development of your tree, it is unlikely that you and another classmates will have an identical tree.
d) Each organism should only be tied to one other organism from the previous era.



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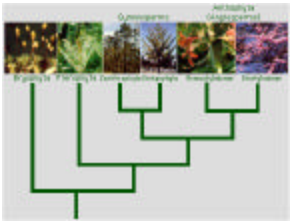
Teacher Supplement

Science Assessment Activity # 7: *Carmaliticus*



Description:
In this activity, students are provided with 66 imaginary organisms that are to be organized into a phylogenetic tree**.** Students provide evidence for the development of the tree using the characteristics of the organisms and then compare their trees to another classmate's tree.

Prerequisite Skills/Knowledge:

- Criteria for classification and using classification systems
- How structure and function in organisms are related
- How organisms adapt to their environment over time
- Understanding of the structure of a phylogenetic tree
- Understanding of the concept of natural selection

Intended Depth of Knowledge Level (DOK):
Level 3 – Develops a scientific model for a complex situation; Completes a multi-step task that requires reasoning and planning; Solves non-routine problems; and Justifies a response when there is more than one possible answer. (Webb)

Suggested Use in BOE System and Curriculum:

The assessment activity will be best used for evidence in the Body of Evidence system for graduation with any life sciences and/or biology courses.

Source: The drawings of organisms for this activity were created by biologist, Joseph Camin. Originally they were called, "Caminalcules" after Dr. Camin. An article in Systematic Biology, by Professor Robert Sokal (SUNY Stonybrook) and Professor Rob Gendron (Indiana University of PA) granted general permission to science teachers for classroom use of these drawings. Assessment Activity "Carmaliticus" is dedicated to the memory of Dr. Camin and his work in the field of biology.

Standards and Benchmarks Science Assessment

An "A" in the table below indicates the standards and benchmarks in this assessment activity that have the potential to elicit evidence of student learning. An "I" indicates that instructional strategy that is assumed, but not assessed. An "A*" indicates the standards and benchmarks that are assessed only by the optional component. This activity has been recoded to the revised Wyoming 2003 Standards by members of the Wyoming Body of Evidence Activities Consortium.

11.1 CONCEPTS AND PROCESSES

In the context of unifying concepts and processes, students develop an understanding of scientific content through inquiry. Science is a dynamic process; concepts and content are best learned through inquiry and investigation.

UNIFYING CONCEPTS AND PROCESSES

Concepts in LIFE SYSTEMS and EARTH, SPACE, and PHYSICAL SYSTEMS are taught within the context of the following Unifying Concepts and Processes of Science:

- Systems, classification, order and organization
- Evidence, models, and explanations
- Change, constancy, and measurement
- Evolution and equilibrium
- Form and function

LIFE SYSTEMS Benchmarks

	11.1.1	The Cell: Students explain the processes of life, which necessitates an understanding of relationship between structure and function of the cell and cellular differentiation. They identify activities taking place in an organism related to metabolic activities in cells, including growth, regulation, transport, and homeostasis. Students differentiate between asexual and sexual reproduction.
	11.1.2	Molecular Basis of Heredity: Students demonstrate an understanding that organisms ensure species continuity by passing genetic information from parent to offspring. They utilize genetic information to make predictions about possible offspring. Students apply concepts of molecular biology (DNA and genes) to recent discoveries.
A	11.1.3	Biological Evolution: Students explain how species evolve over time. They understand that evolution is the consequence of various interactions, including the genetic variability of offspring due to mutation and recombination of genes, and the ensuing selection by the environment of those offspring better able to survive and leave additional offspring. Students discuss natural selection and that its evolutionary consequences provide a scientific explanation for the great diversity of organisms as evidenced by the fossil record. They examine how different species are related by descent from common ancestors. Students are able to explain how organisms are classified based on similarities that reflect their evolutionary relationships, with species being the most fundamental unit of classification.
	11.1.4	Interdependence of Organisms : Students investigate the inter-relationships and interdependence of organisms, including the ecosystem concept, energy flow, competition for resources, and human effects on the environment.

	11.1.5 Matter, Energy, and Organization in Living Systems: Students describe the need of living systems for a continuous input of energy to maintain chemical and physical stability. They explain the flow of energy and organic matter through a series of tropic levels in living systems. Students investigate the distribution and abundance of organisms in ecosystems, which are limited by the availability of matter and energy and the ability of the system to recycle materials.
A	11.1.6 Behavior and Adaptation: Students examine behavior as the sum of responses of an organism to stimuli in its environment, which evolves through adaptation, increasing the potential for species survival. They identify adaptation as characteristics and behaviors of an organism that enhance the chance for survival and reproductive success in a particular environment.
EARTH, SPACE, AND PHYSICAL SYSTEMS Benchmarks	
	11.1.7 Geochemical Cycles: Students describe the Earth as a closed system and demonstrate a conceptual understanding of the following systems: geosphere, hydrosphere, atmosphere, and biosphere. Students explain the role of energy in each of these systems, such as weather patterns, global climate, weathering, and plate tectonics.
	11.1.8 Origin and Evolution of the Earth Systems: Students investigate geologic time through comparing rock sequences, the fossil record, and decay rates of radioactive isotopes.
	11.1.9 Origin and Evolution of the Universe: Students examine evidence for the Big Bang Theory and recognize the immense time scale involved in comparison to human-perceived time. They describe the process of star and planet formation, planetary and stellar evolution including the fusion process, element formation, and dispersion.
	11.1.10 Structure and Properties of Matter: Students describe the atomic structure of matter including subatomic particles, their properties, and interactions. They recognize that elements are organized into groups in the periodic table based on their outermost electrons and these groups have similar properties. They explain chemical bonding in terms of the transfer or sharing of electrons between atoms. Students describe physical states of matter and phase changes. Students differentiate between chemical and physical properties, and chemical and physical changes.
	11.1.11 Chemical Reactions: Students recognize that chemical reactions take place all around us. They realize that chemical reactions may release or consume energy, occur at different rates, and result in the formation of different substances. They identify the factors that affect reaction rates.
	11.1.12 Conservation of Energy and Increase in Disorder: Students demonstrate an understanding of the laws of conservation of mass and energy within the context of physical and chemical changes. They realize the tendency for systems to increase in disorder without an input of energy.
	11.1.13 Energy and Matter: Students demonstrate an understanding of types of energy, energy transfer and transformations, and the relationship between energy and matter.
	11.1.14 Force and Motion: Students develop a conceptual understanding of Newton's Laws of Motion, gravity, electricity, and magnetism.

Science Assessment Activity # 7 – Carmaliticus

11.2 SCIENCE AS INQUIRY

Students demonstrate knowledge, skills, and habits of mind necessary to safely perform scientific inquiry. Inquiry is the foundation for the development of content, teaching students the use of processes of science that enable them to construct and develop their own knowledge. Inquiry requires appropriate field, classroom, and laboratory experiences with suitable facilities and equipment.

	SCIENCE AS INQUIRY Benchmarks
	11.2.1 Students research scientific information and present findings through appropriate means.
	11.2.2 Students use inquiry to conduct scientific investigations. ▪ Pose problems and identify questions and concepts to design and conduct an investigation. ▪ Collect, organize, and analyze and appropriately represent data. ▪ Give priority to evidence in drawing conclusions and making connections to scientific concepts. ▪ Clearly and accurately communicate the result of the investigation.
A	11.2.3 Students clearly and accurately communicate the result of their own work as well as information from other sources.
	11.2.4 Students investigate the relationships between science and technology and the role of technological design in meeting human needs.
	11.2.5 Students properly use appropriate scientific and safety equipment, recognize hazards and safety symbols, and observe standard safety procedures.

11.3 HISTORY AND NATURE OF SCIENCE IN PERSONAL AND SOCIAL DECISIONS

Students recognize the nature of science, its history, and its connections to personal, social, economic, and political decisions. Historically, scientific events have had significant impacts on our cultural heritage.

	HISTORY AND NATURE OF SCIENCE Benchmarks
	11.3.1 Students examine the nature and history of science. ▪ As scientific knowledge evolves, it impacts personal, social, economic, and political decisions. ▪ The historical misuse of scientific information to make personal, social, economic, and political decisions.
	11.3.2 Students examine how scientific information is used to make decisions. ▪ Interdisciplinary connections of the sciences and connections to other subject areas and career opportunities. ▪ The role of science in solving personal, local, national, and global problems. ▪ The origins, limitations, and conservation of natural resources, including Wyoming examples.

Assessment Guide: Science Assessment Activity # 7 – Carmaliticus

Criterion: Phylogenetic Tree *Student uses scientific evidence to develop a phylogenetic tree (model) that illustrates evolutionary change and classification systems.*

Standards and Benchmarks: 11.1.6, 11.2.3 **Intended Depth of Knowledge: Level 3**

Level 4	Level 3	Level 2	Level 1
Demonstrates an in-depth understanding or extensive knowledge of the concepts by… Showing alternative ways to demonstrate evolutionary change or classification using the tree. **OR** Understanding and interpretation are enhanced by the visual presentation and/or spatial organization, including: o Color coding o Providing Keys o Use of space	Classification system accurately applied: o Organisms are placed in correct time periods. o Branches are distinctive – They do not overlap or cross over other branches. Evolutionary changes accurately applied: o The sequence of organisms is logical based upon the characteristics of the individuals and the individuals in the group. o Extinct branches are clearly evident (identified with a clearly labeled line, label, etc.). o All eras are accurately labeled. Support: The student received no support or minor support. Minor flaws may be present.	Although the majority of the tree is correctly organized, inconsistencies were evidenced in one of the following: o Branches (E.g., Branches cross or overlap. Extinct branches are not clearly evident.); OR o Eras (E.g., Organisms in the wrong Era, not all eras labeled.); OR o Within branches (E.g., More than one organism is connected to a previous organism. Organisms not linked according to physical characteristics. Not all the organisms are included in the tree.). All the major components required in the activity have been addressed, but there are gaps or missing sub-components **OR** Support: Response fulfills requirements of a Level 3, but the student received support without which the work would not be of a Level 3 quality.	Lacks more than one of these major components. o Eras o Labels o Carmaliticus o Branches **OR** Attempts an organization, but errors or significant inconsistencies were evidenced in two or more of the following: o Branches (E.g., Branches cross or overlap.); OR o Eras (E.g., Organisms in the wrong Era.); OR o Within branches (E.g., More than one organism is connected to a previous organisms. Organisms not linked according to physical characteristics.) **OR** Support: Response fulfills the requirements of a Level 2, but the student received support without which the work would not be of a Level 2 quality.

Assessment Guide: Science Assessment Activity # 7 – Carmaliticus

Criterion: Classification *Student uses scientific evidence to describe the classification system and the evolutionary changes illustrated in the phylogenetic tree.*

Standards and Benchmarks: 11.1.3 **Intended Depth of Knowledge: Level 3**

Level 4	Level 3	Level 2	Level 1
Demonstrates an in depth understanding or extensive knowledge of the concepts. A written explanation is provided that supports an alternative classification system and shows the similarities and differences between the systems. OR Evolutionary changes One or more of the following is included in the explanation: • An accurate description that supports the evolutionary changes on an alternative method to organize the tree. • An example of evolution on earth and how it relates to an evolutionary change of the Carmaliticus. • An accurate comparison between two trees that go across multiple Eras. • A defensible extension or connection is made.	Classification systems are supported: Rationale is provided based upon the characteristics of the organisms for how the organisms are placed in branches. Evolutionary changes are supported using identifiable characteristics: Using identifiable characteristics the organisms are related to each other in at least *two branches* with *seven or more Carmaliticus*. Evolutionary changes are supported demonstrating understanding of form to function and function to form: Environments are described within at least four Eras based upon the characteristics of the organisms within the Era. Comparisons: Two trees are compared and descriptions include the comparisons between at least one branch and comparisons of the characteristics of organisms within a branch. Other: Minor flaws or inconsistencies may be present in the explanation, but the flaws do not negatively impact understanding the evolutionary changes. There is a clear connection between the tree and the report. Support: The student received no support or minor support.	Classification systems are partially supported: An attempt is made to provide a rationale, but the rationale is not consistent with the tree or is incomplete or indefensible. Evolutionary changes are partially supported using identifiable characteristics: o Inconsistent descriptions relating one organism to another. o The description only addresses one branch. Form to function and function to form: Inconsistent applications of characteristics of organisms in Eras to the environment. OR…Consistent and accurate application of characteristics is made in only three Eras. Comparisons: Comparisons are attempted but few or no characteristics are noted. OR… Only one of the two required comparisons is made. Support: Response fulfills requirements of a Level 3, but the student received support without which the work would not be of a Level 3 quality.	An explanation for classification is provided, but is not supported with evidence within the tree Attempts are made in the explanation with errors throughout. OR Support: Response fulfills the requirements of a Level 2, but the student received support without which the work would not be of a Level 2 quality; OR The explanation does not meet the requirements even with major support.

Assessment Guide: Science Assessment Activity # 7 – Carmaliticus

Criterion: Communication *Student communicates and applies scientific principles.*
(Note: This criterion assesses communication, not conceptual understanding.)
Standards and Benchmarks: 11.2.3 **Intended Depth of Knowledge: Level 2**

Level 4	Level 3	Level 2	Level 1
Meets requirements of Level 3, **AND** Explanations are strengthened by the use of such things as: o Graphic organizers o Diagrams o A keying system o Cross-referencing o Additional Tables, Models, Graphs	Scientific terms are accurately and appropriately applied in report. The application of grammar and conventions do not get in the way of understanding the results of the experiment.	Inconsistent use of accurate and appropriate scientific terms throughout the report. The application of grammar and conventions get in the way of completely understanding the experiment or results.	Vocabulary use, but inaccurate throughout the report or not used when the opportunity exists; **OR** Used common terms instead of appropriate scientific terminology. The application of grammar and conventions make it hard to follow the explanations and/or the results of the experiment.

Assessment Guide: Science Assessment Activity # 7 – Carmaliticus

Criterion: Basic Concepts and Knowledge *Student demonstrates an understanding of scientific concepts by accurately explaining and applying facts, theories, principles, and models.*

Standards and Benchmarks: 11.1.3, 11.1.6 **Intended Depth of Knowledge: Level 3**

Level 4	Level 3	Level 2	Level 1
The facts, theories, principles and/or models evidenced in the response are accurate and appropriately applied based upon the requirements of the activity and the scientific concept(s). In addition, the response includes: o additional models that demonstrate a deeper level of understanding; **OR** o an in-depth analysis of the concepts applied, not required to complete the activity; **OR** o accurate and appropriate applications of the concepts and knowledge to other situations; **OR** o counter arguments or ideas about the concepts; **OR** o related ideas about the concept.	The facts, theories, principles and/or models evidenced in the student response are accurate and appropriately applied based upon the requirements of the activity and the scientific concept(s). **Support:** The student received no support or minor support in the design of the experiment or completion of the assessment activity.	The facts, theories, principles and/or models evidenced in the response are appropriate, but: May include some inaccuracies; **OR** May be applied inappropriately given the requirements of the activity and the scientific concept(s). **OR** **Support:** Response fulfills requirements of a Level 3, but the student received support without which the work would not be of a Level 3 quality.	The facts, theories, principles and/or models evidenced in the response are inappropriate and inaccurate given the requirements of the activity and the scientific concept(s); **OR** Little or no evidence is provided that demonstrates understanding of concepts; **OR** Evidence demonstrates only a beginning understanding of concepts. **OR** **Support:** Response fulfills the requirements of a Level 2, but the student received support without which the work would not be of a Level 2 quality.

Science Assessment Activity # 7: Carmaliticus

Anchor Papers:

This section contains sample student work that has been assessed by Wyoming teachers who participated in the Wyoming Activities-Based Consortium. Using the rubrics for this assessment activity, each example has been assigned score levels and includes accompanying annotated student work and "justifications" explaining assignment of scores.

These examples represent a range of student work, collected as a result of piloting in Wyoming high schools during the 2000-2001 and 2001-2002 school years. In some cases, sample student work for particular score points or for particular parts of assessment activities was not available at the date of publication. The BOE Activities Consortium will add sample student work for those parts and at those score points as they become available.

Anchor papers in this set include:

CR2 - 007
CR2 - 010
CR2 - 013

Science Assessment Activity # 7: Carmaliticus

Anchor #CR2-007

Criterion: Phylogenetic Tree
Level 3

Within the phylogenetic tree, systems are accurately applied (the relationship between organisms 41 and 51). Evolutionary changes are accurately applied (extinct branches are clearly indicated – organism 20). Although this meets all criteria for a Level 3, it does not address any of the extensions to qualify for as a Level 4 (color coding, etc.).

Criterion: Classification
Level 3

The explanations support rationale of classification systems (….eyes, fingers, feet, and shape). Evolutionary changes are supported (…the arms got shorter). Evolutionary changes indicate environment (…live on ground because they have claws). Accurate comparisons are made (There were no significant differences in our trees until the later eras). This paper meets all criteria for a Level 3. It does not address any of the extensions – alternative classification system, alternative way to organize the tree, etc. - to qualify for a score of Level 4.

Criterion: Communication
Level 3

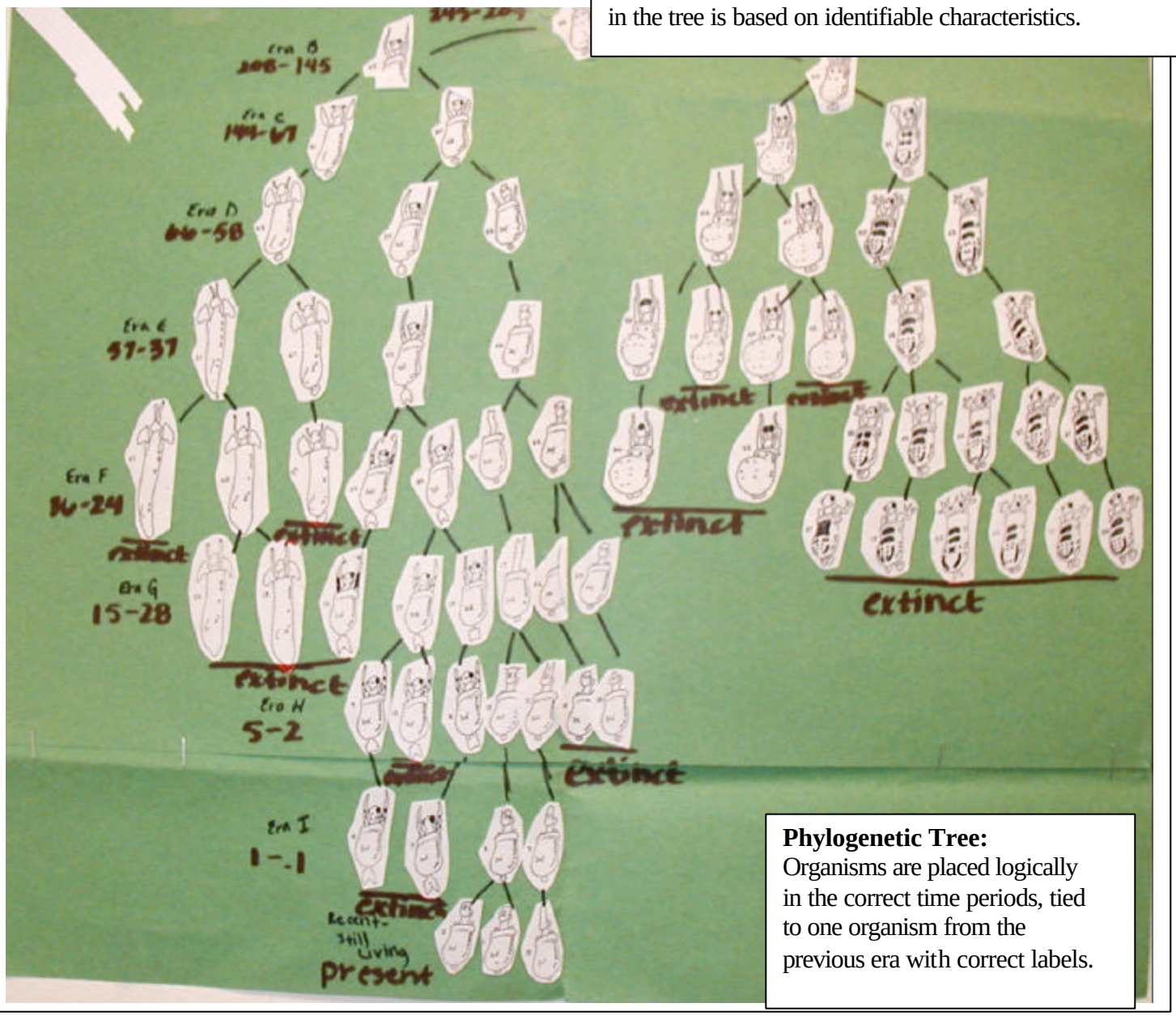
Scientific terms are used accurately and appropriately (have claws and they look like they could dig and climb trees.). The grammar and conventions were appropriate for a Level 3 performance.

Criterion: Basic Concepts and Knowledge
Level 3

The response demonstrated an understanding of scientific concepts by accurately explaining and applying facts, theories, principles and models (evolutionary changes in biological systems; behaviors and adaptations; classification systems; present forms result from changes over time; and the relationship between form and function). This meets all of the criteria for Level 3, but does not address any extensions for a Level 4 (additional models, other situations, etc.).

Science Assessment Activity # 7 Carmaliticus
Anchor #CR2-007

Basic Concepts:
The phylogenetic tree indicates an understanding of evolutionary change. The classification of organisms in the tree is based on identifiable characteristics.



Phylogenetic Tree:
Organisms are placed logically in the correct time periods, tied to one organism from the previous era with correct labels.

Anchor #CR2-007
Science Assessment Activity #7 Carmaliticus

Carmaliticus

Communication: Report shows accurate use of scientific terms, which are appropriate for answering the posed question.

1. I used many different methods for placement of the Carmaliticus and there branches. One type of evidence I used was the shape of the body. If the body was big I would put it under the other kind of organism with a big body. Another way I made my decision was based of the arms. They had many different shapes of arms and the way they looked. If it had long skinny arms it would go under the one with long skinny armed organism. I also looked at such things as the eyes, fingers, feet, and the shapes on the body. These are many different ways that I decided where the organisms were placed.

2. One of the branches in the Carmaliticus tree had many different identifiable characteristics. One of the characteristics is that from 66 to 60, less dots appeared on the shell of the body. From 65 to 60, the shape of the head changed slightly. From 60 to 56, the arms got shorter and the body got slightly shorter. From 56 to 46, the arms got way shorter so that they are barely there any more and the head changed by getting longer and the eyes are not there really any more. From 46 to 30, the head changes from rounded tip to a head that looks like the end of a snakes tongue. From 30 to 17, the head got longer and straighter. From 17 to 11, the head became bent and the tip of the head became different also. From 11 to 5, the head just kept on changing. It doesn't look like a snake tongue any more, it just has one tip instead of two.

Classification: Rationale is provided based upon the characteristics of the organisms for placement.

Another one of the branches in the Carmaliticus tree had some changes also. From 64 to 62, the head changed and more and darker dots appeared, also it started to get hands. From 62 to 55, fingers started to appear, 2 feet are there instead of just one big one, and the spots got bolder. From 55 to 48, it stayed about the same except the legs started to come back together into one. From 48 to 42, the fingers became pointed. From 42 to 15, a nose appeared, the arms bent back, and the fingers grew sharp claws, and the feet grew apart and the toes appeared.

Classification: Organisms are related to each other in at least two branches, using identifiable characteristics.

3. These organisms could live in many different kinds of environments. The most recent organism look something like a snail so I think they would live in water and on the ground just like a snail would. In Era G, I think they would live on ground because they have claws and they look like they could dig and climb trees. The other organisms in Era G look like they would live in the water because they have a paddle looking thing on the bottom of them so they could swim. In Era B they look like they would live in the water along with Era A because there arms look like they would swim and the body looks like it would float. These are different environments that I think

Basic Concepts: The report indicates an understanding of adaptations to the environment.

Classification: Environments are described within at least four eras, based upon the characteristics of the organisms.

Anchor #CR2-007
Science Assessment Activity #7 Carmaliticus

CR2-007

4. In our trees, there were no significant differences in our trees until the later Eras. Our organisms differed the most in Era G. The branch with legs and dark strips and fingers were classified different. We also found a difference in classification during Era H. All of our organisms became extinct during the same Era and our tree showed five main branches.

During Era G, when we compared our trees we discovered that our methods of organization were different. I classified mine mainly based on the shape of the head during this era. She mainly focused on the organisms limbs. For other individual differences, I found them in the design on the body while she looked at the shape of the upper body. Her organism 33 had no offspring while mine had two offspring.

During Era H, when we looked at the long tailed organisms with arms, I looked at the heads while she looked more at the tails. In Era I when this branch of species died off, both of the surviving offspring were under 12 for her and mine has come singly from 9 to 4 and 8 to 7. These are our differences in our organism trees.

Classification:
Two trees are compared. The descriptions include the comparisons of characteristics of organisms within a branch.

3B

Science Assessment Activity # 7: Carmaliticus

Anchor #CR2-010

Criterion: Phylogenetic Tree
Level 2

The Phylogenetic tree is present and has branches and clearly marked extinctions; however, this is a Level 2, because the branches cross and overlap. (See organisms in Eras F, G, H.)

Criterion: Classification
Level 2

This paper is a Level 2, because an attempt was made to provide a rationale (branches was their eyes; Another was the shape of their shell); however, chosen characteristics are not consistently applied throughout. (In one of my branches some of their fins started to change into feet.) A comparison of phylogenetic trees is present; however, characteristics are not stated or discussed in the comparison (B has 36 coming from 46 and I have 36 coming from 52).

Criterion: Communication
Level 2

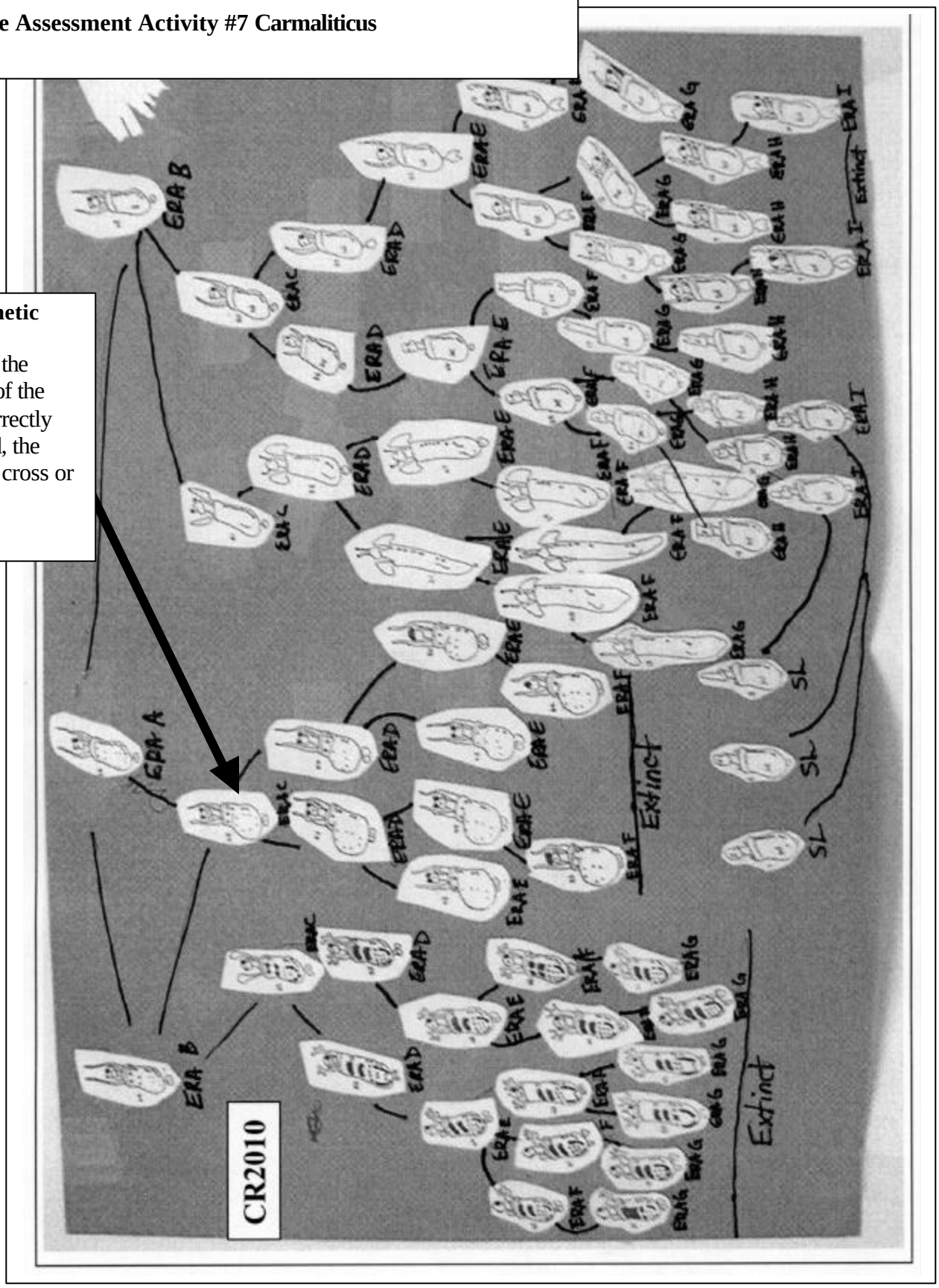
Some scientific terms are used; however, they are not used consistently (feet and arms/fins). A comparison is present (B has 36 coming from 46 and I have 36 coming from 52); however, characteristics are not stated in the comparison.

Criterion: Basic Concepts and Knowledge
Level 2

The facts, theories, principles and/or models are present (Era C lives in mountainous creek beds; Their shells are thicker to withstand the cold mountain water; They also blend better with the rocks); however, this is a Level 2, because the science concepts discussed demonstrate some inaccuracies or differences are not fully explained (arms are good for swimming - for organisms living in water, burrowing in seaweed, living in creek beds, and living in swamps).

Anchor # CR2-010
Science Assessment Activity #7 Carmaliticus

Phylogenetic Tree:
Although the majority of the tree is correctly organized, the branches cross or overlap.



Anchor #CR2-010
Science Assessment Activity # 7 Carmaliticus

Carmaliticus

Classification:
An attempt is made to provide a rationale; however, chosen characteristics are not consistently applied throughout.

1. One way that I made decisions regarding the placement of them and their branches was their eyes. Another way was the shape of their shell. Other characteristics I looked at were spots on the shells, the antennas, feet, and arms.

Communication:
Some scientific terminology is used, however it is used inconsistently.

Basic Concepts:
The facts, theories, principles and/or models show some inaccuracies.

2. In one of my branches some of their fins started to change into feet. Some of their spots turned into stripes. Their antennas started to get shorter or longer. Some also started to grow claws. Their shells also got longer gradually.

3. I think Era A lives in the water because they have wavy arms that are good for swimming. Era B lives in the same general area except they burrow in the seaweed more because it protects them better because they don't have as many spots. Era C lives in mountainous creek beds. Their shells are thicker to withstand the cold mountain water. They also blend better with the rocks. They have arms for swimming. Era D lives in the swamp. They have darker coloring for the murky swamps. Their arms are also good for swimming.

4. B· has 36 coming from 46 and I have 36 coming from 52. The other significant difference is that I have 32 coming from 50 and B· has 34 coming from 45. Branch number 66-32 was exactly the same. All branches except for the two that I already stated were exactly the same.

Classification:
A comparison is present; however, characteristics are not stated or discussed in the comparison.

Communication:
The application of conventions gets in the way of understanding the report.

Science Assessment Activity # 7: Carmaliticus

Anchor #CR2-013

Criterion: Phylogenic Tree
Level 1

A phylogenetic tree was constructed which included all the organisms. This is a Level 1 response, because the branches of the tree were not distinctive, eras were not labeled, extinctions were not indicated, and organisms were not placed in the correct eras (the last era with its three organisms was buried in a large group of organisms on the bottom row of the tree). It appears that the student merely pasted the organisms into a tree-like shape with little thought to organization or meaning.

Criterion: Classification
Level 1

Characteristics were identified that could be used to classify the organisms ("there were similarities in the stripes and spots on their bodies"). Different environments were mentioned ("places with water" and "dry places") and evolutionary change of the organism was noted ("they had begun to make strange looking heads, form tentacles, and develop black spots on their back"). This is a Level 1 paper, because two branches were not identified. Organism placement within any branch was not discussed. No rationale for the placement of organisms was provided. Only three eras were identified (era A, era I, and era E), but no possible environments were proposed. Characteristics of the organism were not linked to possible environments. No comparison to another student's phylogenic tree was present in the report.

Criterion: Communication
Level 1

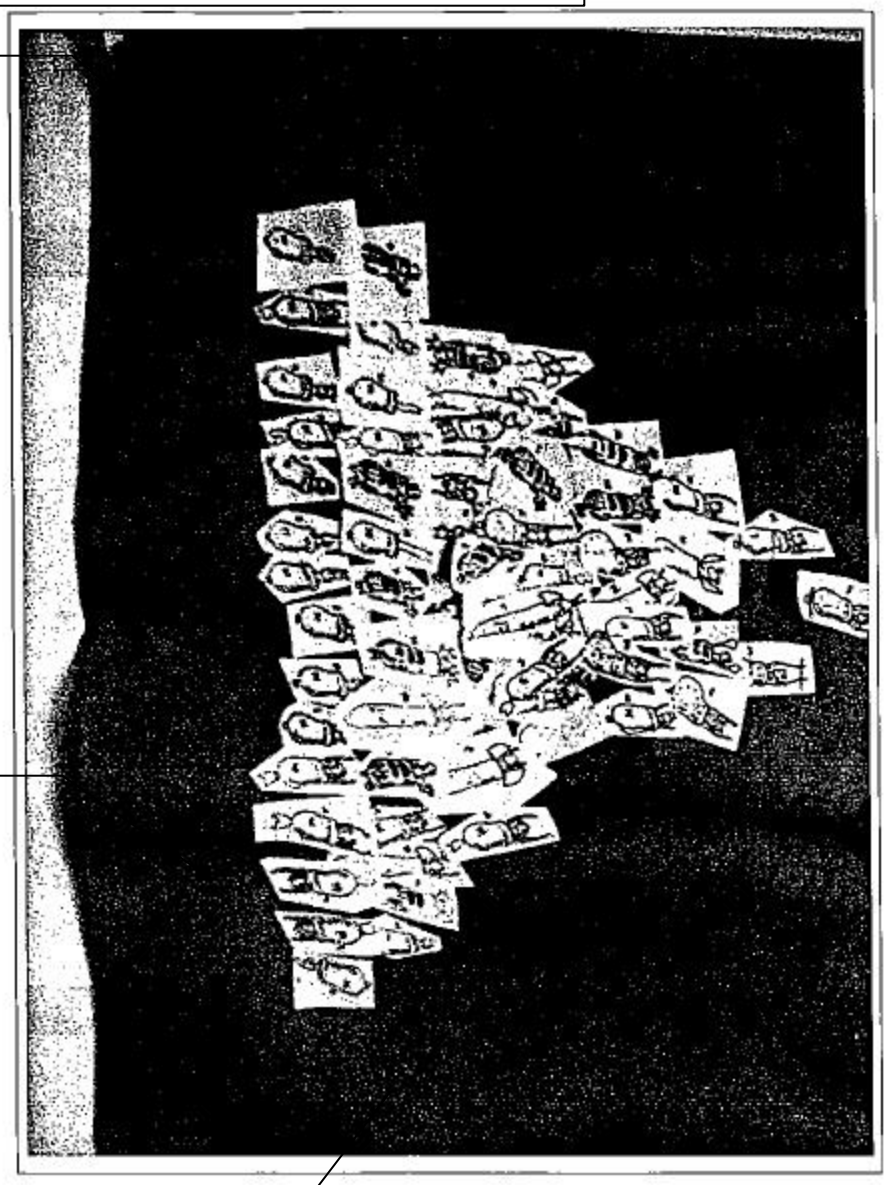
This is a Level 1 paper, because there was little or no use of scientific vocabulary in the report (arms, fingers,) and inappropriate use of vocabulary ("The environment will make them adapt to the different weather, camouflage, and to the different types of predators.").

Criterion: Basic Concepts and Knowledge
Level 1

Two brief mentions were made of evolutionary change ("Some had adapted to live in places with water, and some had adapted to live in dry places" and "They would form spots that the parents didn't have, it would develop arms that the parents didn't have."). This is a Level 1 response, because no evidence was provided to demonstrate an understanding of evolution. No "cause and effect" was provided. No discussion of function to form or form to function is present.

Anchor #CR2-013
Science Assessment Activity #7: Carmaliticus

Tree:
All organisms appear to be placed on phylogenetic tree.



Tree:
Final era and its three organisms are buried in last row.

Tree:
Branches are not distinctive. Eras are not labeled. Extinctions are not indicated. Organisms are placed in wrong eras.

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CR2013

Anchor #CR2-013
Science Assessment Activity #7 Carmaliticus

CR2-013

The Tree of Life

1) There are a lot of different factors used to decide where to put the different organisms. I looked at similar items on their bodies. There were similarities in the stripes and spots on their bodies. A lot of the heads, arms, bodies, eyes, and fingers were the same. I took to mind the environment that they might be living in, such as water, desert, or forest. The environment will make them adapt to the different weather, camouflage, and to the different types of predators. They could form counter attacks to make all the other animals be scared of them, or to get them away when they try to attack.

Classification: Characteristics are identified for use in classifying the organisms.

Communication: There is an inappropriate use of science vocabulary.

2) The first generations of the Carmaliticus where very different then the ones at the end of the chain. They had started to adapt to their new environments. Some had adapted to live in places with water, and some had adapted to live in dry places. They had begun to make strange looking heads, form tentacles, and develop black spots on their backs.

3) In some of the eras the species of animals didn't look anything like their parents. They would form spots that the parents didn't have, it would

Classification: Two branches are not identified.

Classification: No rationale for organism placement exists.

Basic Concepts: There is no discussion of evolutionary change based on characteristics – form to function, function to form.

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Classification: Organism placement in branches is not discussed.

Anchor #CR2-013
Science Assessment Activity #7 Carmaliticus

CR2-013

develop arms that the parents didn't have and other small things. The Carmaliticus evolved to make their environment easier to live in. Their hand would be shaped different to make it easier to swim, dig, or even just run faster. In Era A, the Organism looked a lot like the animals in Era I. In Era E some of the animals have formed legs to walk.

Classification:
Characteristics are not linked to possible environments.

Classification:
Three eras are identified, but possible environments are not proposed.

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